

Mathematics 3310 – Introduction to Problem Solving

Student Learning Outcomes

1. **The students will describe the fundamental principles including the mathematical rules and theorems arising from the concepts covered in this course.** Students will demonstrate mastery in using the vocabulary, symbolism, and laws and formulas of precalculus-level courses including geometry, college algebra, trigonometry, and analytic geometry.
2. **The students will apply course material using techniques and procedures covered in this course to solve problems.** Students will utilize techniques learned in this course to solve mathematics problems; techniques include finding patterns, working backwards, arguing by induction, arguing by contradiction, using mathematical symmetry, and adopting a different point of view.
3. **The students will develop skills in communicating mathematics orally and in writing.** Students will submit fully justified and carefully prepared written solutions to problems; students will also participate in problem presentations both as a presenter and as a classroom participant.

Course Content

Textbook: Required course notes are available in the bookstore.

1. **Introduction.** Basic overview of problem-solving processes.
2. **Mathematical Logic.** Introduction to mathematical statements and mathematical arguments.
3. **Maple.** Maple is a comprehensive computer algebra system, which will be utilized not only to carry out mathematically tedious manipulations, but also to gain insight into potential solution techniques.
4. **Gaining Insight.** Problem-solving techniques that are good first steps for gaining insight into a problem solution will be considered.
5. **Useful Tactics.** Provides a review of mathematical tactics that are extensively utilized in solving problems.
6. **Finding Patterns.** Focusing on pattern recognition as a problem-solving technique.
7. **Induction.** Introduces a general approach for showing a property/formula holds for an infinite set of integers.
8. **Working Backwards.** Concentrates on using the result that is to be obtained to seek ideas for solving a problem.
9. **Contradiction.** Provides examples of how an indirect argument can be used to solve problems.
10. **Symmetry and Extremes.** Focuses on using the characteristics of items in a problem to aid in solving a problem.
11. **Adopting a Different Point of View.** Stresses the importance having a willingness to try different approaches to solve a problem.